Amendment to the Claims:

The claims under examination in this application, including their current status and changes made in this paper, are respectfully presented.

1 (original). In a bi-directional data transmission system that facilitates communications between a central unit and a plurality of remote units using a frame based discrete multi-carrier transmission scheme that has a multiplicity of discrete subchannels including an overhead bus having a plurality of overhead subchannels, a method of synchronizing frames transmitted from a selected remote unit to the central unit, the method comprising the steps of:

(a) when the selected first remote unit desires to establish communications with the central unit, receiving a first signal from the central unit and loop timing a clock at the selected first remote unit with a clock signal carried in the first signal;

(b) transmitting a remote initiated synchronization signal from the loop timed selected first remote unit to the central unit over an overhead subchannel in the overhead bus when the selected first remote unit desires to establish communications with the central unit;

(c) transmitting a centrally initiated synchronization signal from the central unit to the selected first remote unit when the central unit receives the remote initiated synchronization signal, wherein the centrally initiated synchronization signal contains information indicative of a frame boundary phase shift required to better synchronize the selected first remote unit with other remote units that are currently communicating with the central unit; and

(d) shifting the phase of the frames outputted by the selected first remote unit in response to the centrally initiated synchronization signal to better synchronize the frame boundaries of the frames outputted by the selected first remote unit with frame boundaries of frames output by the other remote units that are currently communicating with the central unit; whereby the synchronization is arranged such that when fully synchronized, the frame boundaries from the various remotes will substantially coincide when they are received at the central unit.

2 (original). A method as recited in claim 1 wherein the overhead bus includes two dedicated overhead subchannels, and the remote initiated synchronization signal and the centrally initiated synchronization signal are transmitted over different overhead subchannels.

3 (original). A method as recited in claim 1 wherein a single dedicated overhead subchannel is provided, and the remote initiated synchronization signal and the centrally initiated synchronization signal are both transmitted over the single dedicated overhead subchannel.

4 (original). A method as recited in claim 1 wherein when two of the remote units transmit their associated remote initiated synchronization signals at substantially the same time, a conflict is recognized and the remotes units each resend an associated remote initiated synchronization signal.

5 (original). A method as recited in claim 1 wherein steps b, c and d are repeated until the selected remote unit is fully synchronized and further comprising the step of initiating normal communications from the selected remote unit to the central unit.

6 (withdrawn). A discrete multi-carrier central modem unit for use in a bi-directional data transmission system that facilitates communications between the central modem unit and a plurality of remote modem units, the central modem unit comprising:

an encoder for encoding digital information; a monitor for monitoring a communication line to determine line quality parameters indicative of noise levels at each of a multiplicity of subchannels, each subchannel corresponding in frequency to an associated subcarrier;

a modulator for modulating the encoded digital information onto a multiplicity of subcarriers in a frame based discrete multi-tone signal, each subcarrier corresponding to an associated tone and an associated subchannel, the modulation being arranged to take into consideration at least the detected line quality parameters and a permissible power mask parameter, and wherein the modulation is capable of dynamically updating both the subchannels used and the amount of data transmitted on each subchannel during transmission in order to accommodate real time changes in specific parameters;

an apparatus for appending a cyclic prefix to the discrete multi-tone signal before it is applied to the transmission line; and

a synchronizer for monitoring signals received over a dedicated overhead subchannel, identifying a remote initiated synchronization signal that is received on the overhead subchannel, determining the phase shift between a frame boundary of the remote initiated synchronization signal and a frame boundary of a frame in said discrete multi-tone signal and generating a centrally initiated synchronization signal for transmission to the remote modem units that is indicative of a frame boundary phase shift required to synchronize a selected remote modem that initiated the remote initiated synchronization signal with other remote units that are currently communicating with the central modem unit.

7 (withdrawn). A discrete multi-carrier remote modem unit for use in a bi-directional data transmission system that facilitates communications between a central modem unit and a plurality of said remote modem units, the remote modem unit comprising:

a demodulator for demodulating a first discrete multi-tone signal indicative of a first set of digital information, the demodulator being arranged to receive modulation information as part of the discrete multi-tone signal, wherein the demodulator is capable of dynamic updating during reception in response to changed modulation information in order to accommodate real time changes in the modulation scheme, the demodulator being arranged to strip a cyclic prefix from the discrete multi-tone signal;

a decoder for decoding the demodulated digital information in real time; an encoder for encoding a second set of digital information;

a modulator for modulating the encoded second set of digital information onto a multiplicity of subcarriers in a second discrete multi-tone signal, each subcarrier in the second discrete multi-tone signal corresponding to an associated tone and an associated subchannel; and

a synchronizer for generating a first synchronization signal that is applied to an overhead subcarrier when the discrete multi-tone remote modem desires to initiate communications to the central modem, receiving a second synchronization signal from the central modem that is indicative of a frame boundary phase shift required to synchronize the

remote modem with other remote units that are currently communicating with the central modem unit, and shifting the phase of the second discrete multi-tone signal so that it is synchronized at the central modem with multi-tone signals sent by said other remote units.

8 (withdrawn). A remote modem unit as recited in claim 7 wherein the demodulator further includes a time domain equalizer.

9 (withdrawn). A remote modem unit as recited in claim 7 wherein the demodulator and the decoder are part of a receiver, and the remote unit further comprises an analog notch filter arranged to filter the first discrete multi-tone signal before it is passed to the receiver to reduce the energy level of the signals handled by the receiver.

10 (original). In a bi-directional data transmission system that facilitates communications between a central unit and a plurality of remote units using a frame based discrete multi-carrier transmission scheme that has a multiplicity of discrete subchannels including an overhead bus, a method of synchronizing frames transmitted from a selected remote unit to the central unit, the method comprising the steps of:

when the selected first remote unit desires to establish communications with the central unit, receiving a first signal from the central unit and loop timing a clock at the selected first remote unit with a clock signal carried in the first signal;

transmitting a remote initiated synchronization signal from the selected first remote unit to the central unit over a dedicated overhead subchannel in the overhead bus when the clock is loop timed with the clock signal in the first signal;

receiving a centrally initiated synchronization signal transmitted from the central unit in response to the remote initiated synchronization signal, wherein the centrally initiated synchronization signal contains information indicative of a frame boundary phase shift required to synchronize the selected first remote unit with other remote units that are currently communicating with the central unit; and

shifting the phase of the frames outputted by the selected first remote unit in response to the centrally initiated synchronization signal to better synchronize the frame boundaries of the frames outputted by the selected first remote unit with frame boundaries of

frames output by the other remote units that are currently communicating with the central unit, the synchronization being arranged to occur such that the frame boundaries from the various remotes are arranged to substantially coincide when they are received at the central unit.

11 (original). In a bi-directional data transmission system that facilitates communications between a plurality of remote units and a central unit and using a frame based discrete multi-carrier transmission scheme that has a multiplicity of discrete sub-channels for facilitating upstream communications between the plurality of remote units and the central unit, a method of synchronizing frames transmitted from a selected first remote unit to the central unit with frames transmitted from other remote units to the central unit, such that frame boundaries of the frames transmitted from the first remote unit arrive at the central unit substantially in synchrony with frames boundaries of frames transmitted from the other remote units, the method comprising the steps of:

periodically providing synchronized quiet times on the plurality of discrete subchannels provided for facilitating upstream communications; and

transmitting a broad band initialization signal from the first remote unit to the central unit during a first selected synchronized quiet time, the broad band initialization signal including a plurality of initialization signals transmitted over distinct sub-channels, the broad band initialization signal having frame boundary.

12 (original). A method as recited in claim 11 wherein:

when the first remote unit desires to establish communications with the central unit, said first remote unit monitors downstream communication broadcast by the central unit and substantially synchronizes the frame boundary of the broad band initialization signal with a frame timing marker carried in downstream signals received by the remote unit; the central unit receives the broad band initialization signal and sends a synchronization signal to the first remote unit, the synchronization signal having information indicative of a frame boundary shift required to better synchronize frame boundaries of signals sent by the first remote unit with frame boundaries of signals sent by other remote units that are communicating with the central unit; and

shifting the boundary of the frames outputted by the first remote unit in response to the synchronization signal to better synchronize the frame boundaries of the frames outputted by the first remote unit with the frame boundaries of frames output by the other remote units that are currently communicating with the central unit; and whereby the synchronization is arranged such that when fully synchronized, the frame boundaries from the various remotes will substantially coincide when they are received at the central unit.

13 (currently amended). A method as recited in claim 11 or 12 further comprising the step of periodically providing synchronized training times on the plurality of discrete sub-channels provided for facilitating upstream communications, wherein remote units that are not requested to train or retrain during a particular training time are quiet during that particular training time.

14 (original). A method as recited in claim 13 further comprising the step of causing the first remote unit to send a plurality of training signals over a number of the sub-channels provided for facilitating upstream communications during a selected training time.

15 (original). A method as recited in claim 14 further comprising the step of determining a first set of channel characteristics indicative of the channel capacities of the multiplicity of sub-channels provided for facilitating upstream communications.

16 (original). A method as recited in claim 15 further comprising the step of saving the first set of channel characteristics within a matrix of channel characteristics, wherein said matrix contains information indicative of the channel capacities of the multiplicity of discrete sub-channels between all the remote units and the central unit.

17 (original). A method as recited any one of claims 11-16 further comprising the steps of:

recognizing a conflict when more than one of said remote units transmits an associated broad band initialization signal during the first selected synchronization time; transmitting a conflict signal to the plurality of remote units in response to the broad band initialization signals when a conflict is recognized;

and wherein each of the conflicting remote units resends its broad band initialization signal during a later one of said synchronized quiet times, the conflicting remote units being arranged to each wait an independently random interval prior to resending its broad band initialization signal.

18 (original). A method as recited in any one of claims 11-17 wherein the synchronized quiet time has a period that is sufficiently long such a quiet period marker transmitted from the central unit may be transmitted to the remote unit that is furthest from the central unit and an initialization signal that is responsive to the quiet period marker returned to the central unit all within the synchronized quiet time.

19 (original). A method as recited in claim 18 wherein the synchronized quiet time has a period in the range of approximately 50 to 500 milliseconds.

20 (original). A method as recited in claims 11-19 further comprising the step of periodically transmitting from the central unit an indication of sub-channels that are forbidden from use by the remote unit, wherein the remote unit makes sure that the broad band initialization signal does not include any transmissions in the sub-channels that are forbidden from use.

21 (original). A method as recited in claim 12 wherein the downstream communications are discrete multi-tone signals and the frame timing marker carried in the downstream signals received by the remote unit are frame boundaries of the downstream discrete multi-tone signals.

22 (original). A method as recited in claim 12 wherein the downstream communications are selected from the group consisting of quadrature amplitude modulated signals and vesigial sideband signals.

Claims 23 through 55 are canceled.